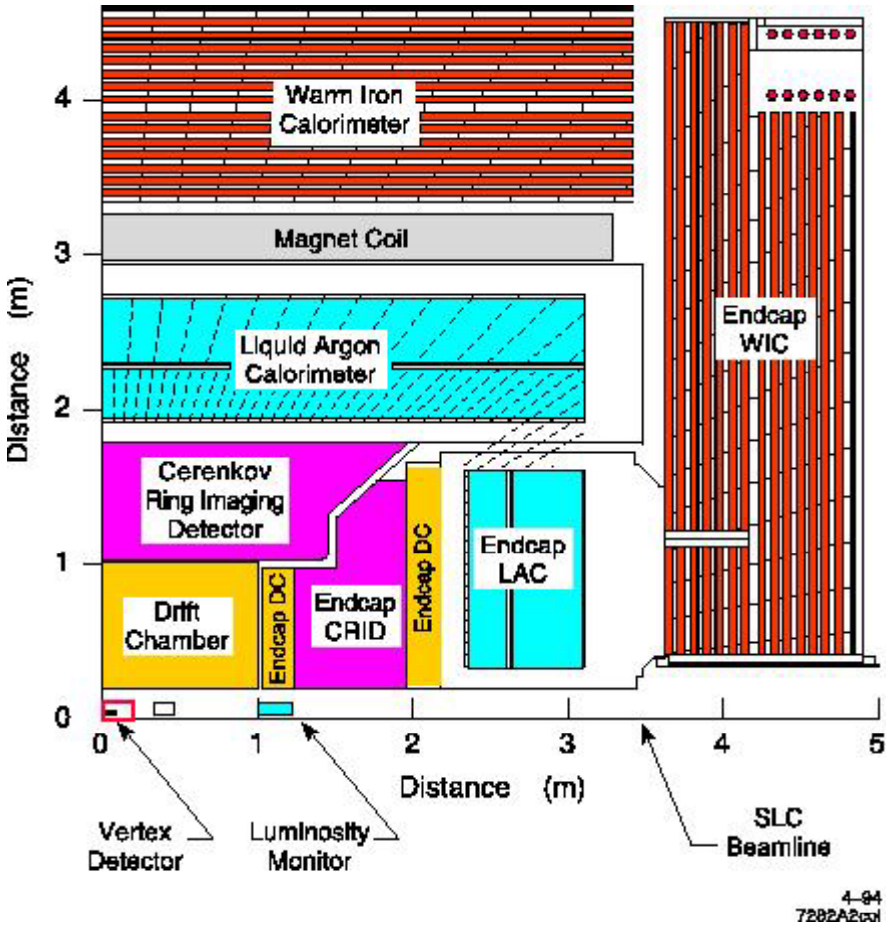
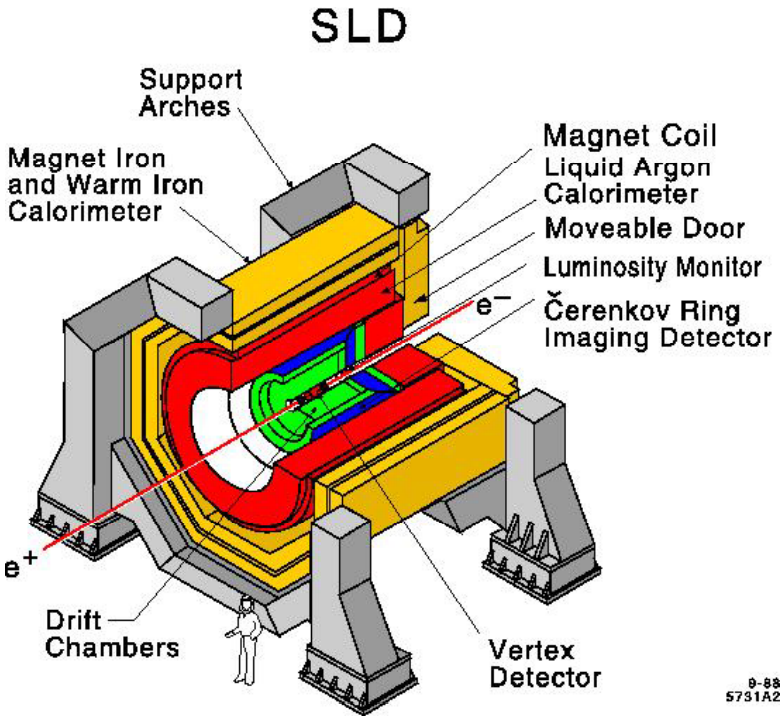
SiD Concept

- SiD is relatively modest in scale compared to the LHC detectors, and comparable to SLD:

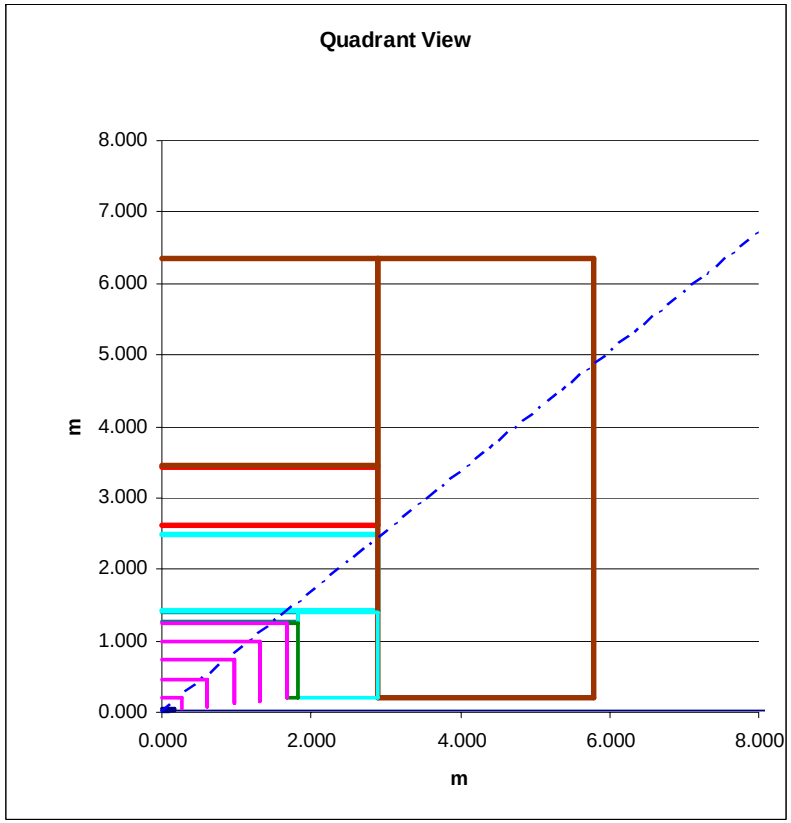
	Tracker Radius	Inner Coil Radius	Outer Iron Radius	Half Length to pole face	Total Mass (Ktonne)
SLD	1.0	2.9	4.5	3.6	~4
SiD	1.25	2.6	6.3	2.9	~9

SLD


Warm Iron Calorimeter
Magnet Coil
Liquid Argon Calorimeter
Endcap WIC
Cerenkov Ring Imaging Detector
Endcap DC
Endcap CRID
Endcap DC
Endcap LAC
Drift Chamber
Distance (m)
Distance (m)
0
1
2
3
4
5
Vertex Detector
Luminosity Monitor
SLC Beamline
4-94
7282A2col


SLD
Support Arches
Magnet Iron and Warm Iron Calorimeter
Magnet Coil
Liquid Argon Calorimeter
Moveable Door
Luminosity Monitor
Čerenkov Ring Imaging Detector
e−
e+
Drift Chambers
Vertex Detector
9-88
5731A2

SiD


Quadrant View
8.000
7.000
6.000
5.000
4.000
3.000
2.000
1.000
0.000
m
0.000
2.000
4.000
6.000
8.000
m

Comments

- Overall mechanical approach to SiD similar to SLD – but must emphasize very little engineering done so far.
- Iron yoke supported from "exoskeleton" frame at each end.
  - End frames tied together by return yoke.
  - End frames carry doors when detector is traveling.
  - Return yoke take magnetic compressive force of doors.
- Doors are not split. Motivation for split door appears to be that components of forward calorimetry could have larger radius than door opening. SiD has avoided this.
  - No "seams" in endcap tracking or calorimetry or muon tracking.
  - Stronger structure to take magnetic forces.
  - Fewer pieces to move.

Comments

- Doors retract along Z axis.
  - Simple 1-D motion.
  - Works well with beamline shielding (Pacmen)
  - Sliding support for final lens (needs active compensation as door retracts).
  - ~2m motion for people access.
- This approach worked well for SLD:
  - Designed for (and tested in!) major earthquake.
  - Measured transverse motion of SLC lens package ~50 nm (spec was 0.5 micrometer – SLC achieved much smaller beams vertically than expected, so extra stability was nice!)
  - Door opening or closing ~2 hours (including everything, but with practice). Cryogenic systems (LArgon calorimeters, superconducting quads undisturbed (but quads run down).
  - Simple alignment system put final quads within 1 mm of beamline. Beam based alignment and tuning to full luminosity < 8 hours.
  - Doors moved on Hilman Rollers on flat rails, with pitch, roll, and elevation adjustment from computer controlled hydraulic jacks. (Jacks ~never used after initial alignment). Drive was hydraulic motors to ball screws.

Is a platform needed for Push-Pull?

- A platform may be motivated by the basic detector architecture – e.g. a legless structure might need a platform.
- A stiff platform might be useful if the detector is floppy – but a stiff platform needs some height – which is likely to increase the beamline elevation in the IR Hall – which is probably expensive.
- A stiff platform might be useful if the floor is uneven – but see above. It seems relatively easy to adjust detector leg length hydraulically. (A 560 ton hydraulic jack with a follow nut costs ~$9K)
- The floor may move when loaded and unloaded on a scale that must be corrected. A platform doesn't directly address this.
- A platform could carry auxiliary equipment, such as the solenoid power supply, dump resistors, etc. It seems plausible that this kind of equipment could be on platforms on top and on the sides of the detector, which would not raise the beamline.

Comments

- A platform provides a transversely stiff support for the detector so it can be pushed or pulled without distorting the structure. True- but this would appear to need some analysis to compare the costs of a platform to the costs of struts between the legs to get the necessary stiffness.
- SLD moved on 8 500 ton Hilman Rollers supporting 500 ton jacks, pushed by long stroke jacks. Worked well, but would not copy for SiD. Would suggest looking at roller system on a guide track, and moved by a ball screw(s).
- Whatever the motion system is, it should be a detector responsibility and cost!